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U.S. SOYBEAN ECONOMY IN THE 1980'S

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U.S. SOYBEAN ECONOMY IN THE 1980's

by
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ABSTRACT: Sharp increases in the demand for U.S. soybeans and products are projected during the next 10 to 15 years as domestic and export requirements expand. Barring a breakthrough in soybean yields, acreage needed to satisfy potential soybean demand by 1985 may be a third greater than the 47 million planted in 1972.

The uptrend in domestic use of food fats and oils and protein meals is projected to continue at a rate greater than population growth. Fulfilling this potential demand will be achieved mainly through greater use of soybean products, since supplies of other U.S. edible oils and high-protein feeds probably will show little net change. The major forces influencing demand for soybeans in the long run are population and income growth.

KEY WORDS: Soybean economic projections.

U.S. soybean requirements are expected to continue upward during the next 10 to 15 years, reaching a potential 2.2 billion bushels (59 million metric tons) by 1985. This projected demand is some two-thirds greater than the 1972 record utilization of 1.3 billion bushels and nearly quadruple the 1960 level of 0.6 billion bushels. The average annual rate of increase during 1973-85 is projected around 65 million bushels or about 4 percent.

Soybean domestic use (crush, seed and other uses) for 1985 is projected around 1.2 billion bushels, 50 percent above the current season. Soybean exports may double during this period, reaching a potential 1 billion bushels compared with a half billion this season.

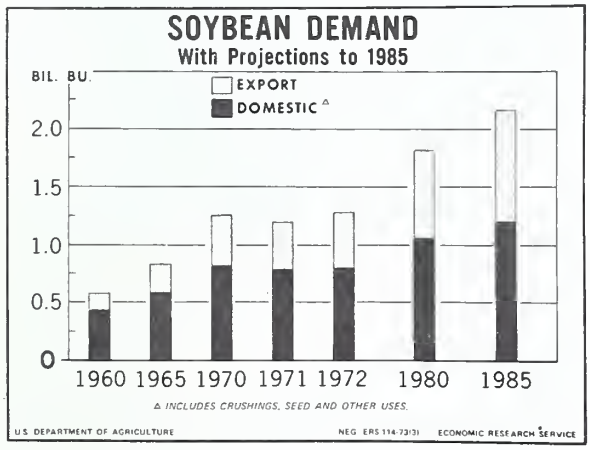

Figure 1

This long-run appraisal of the demand for soybeans—resulting from an assumed continuation of present farm programs, technology, and other economic forces—points up the need for shifting more U.S. acreage into soybean production.

Soybean Acreage Requirements Increasing

U.S. acreage needed to satisfy the projected level of soybean demand in the mid-1980's would be around 62 million harvested acres compared with 46 million in 1972. Of course, if soybean yields increase faster than assumed (a half bushel per acre per year), the potential 1985 soybean requirements could be fulfilled at a lower acreage level.

Any large increases in soybean acreage must come mainly from previously set-aside acreage, corn acreage, or new land. Further transfer of acreage from small grains and hay to soybeans probably will be relatively small, since much of the available land has already been shifted.

Higher Soybean-To-Corn Price Ratio

Whether soybeans can attract acreage away from corn will depend mainly on relative prices and yields from the 2 crops. Historically, soybean yields have increased much more slowly than corn yields. Assuming this trend continues, a higher soybean-to-corn price ratio (greater than 3 to 1) may be required over the years if soybeans are to compete with corn for land. During 1965-72 the ratio averaged 2½ to 1 in favor of beans, and soybean acreage for the past few years rose little.

Soybeans: U.S. acreage, supply and disposition, crop years 1960, 1965, 1970-72 and projections for 1980 and 1985

Item (year beginning September)	Unit	1960	1965	1970	1971	1972 Preliminary	Projections[1] 1980	Projections[1] 1985
		Acreage and yield						
Acreage:								
Planted	Mil. acres	24.4	35.2	43.1	43.5	47.0	57	63
Harvested	"	23.7	34.4	42.2	42.7	45.8	56	62
%Harvested	pct.	97	98	98	98	97	98	98
Yield per acre harvested	bu.	23.5	24.5	26.7	27.5	28.0	32	35
		Supply and disposition						
Supply:								
Beginning stocks, Sept. 1	Mil. bu.	52	30	230	99	72	150	175
Production	"	555	846	1,127	1,176	1,283	1,800	2,150
Total supply	"	607	875	1,357	1,275	1,355	1,950	2,325
Disposition:								
Crushing	Mil. bu.	406	538	760	721	750	960	1,100
Seed	"	33	43	48	51	[70	67	71
Other	"	6	8	15	14		23	29
Total domestic disappearance	"	445	589	823	786	820	1,050	1,200
Exports	"	135	251	434	417	475	750	950
Total disposition	"	580	840	1,258	1,203	1,295	1,800	2,150

[1] Acreage and production derived from projected demand and assumed yields per acre. Stocks levels projected to equal 1 months' total requirements.

Soybeans Most Extensively Planted Crop by 1985

Harvested crop acreage in the United States over the next 10 to 15 years probably will show little net change from the 300-million-acre level of recent years, as anticipated increases in crop yields generally about match projected growth in demand. But the acreage mix among the major crops is expected to change significantly, as soybeans increase sharply while corn and wheat acreages edge downward. Little change is projected for cotton acreage. By 1985 soybeans may require more acres than any other domestic crop, possibly accounting for a fifth of total harvested acres. During 1969-71 soybean's share averaged 14%.

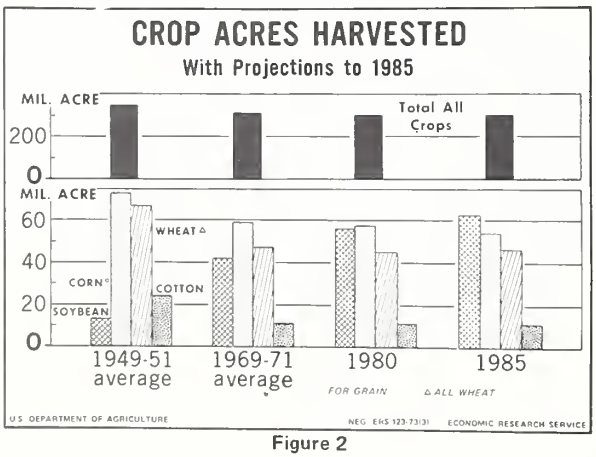

Figure 2

Major Assumptions

The basic assumptions in this analysis are:

1) Domestic farm programs to encourage the adjustments of crop supplies in line with market needs will be continued in some form.

2) Acreage and production will increase as needed to meet projected soybean requirements.

3) No breakthrough in soybean yields per acre but an annual average increase of a half bushel or about 1½%.

4) Continuation of Public Law 480 program exports.

5) World agricultural trade policies will continue substantially as now.

6) Increased U.S. agricultural trade with Eastern Europe, USSR, and the People's Republic of China.

7) Uptrend in U.S. per capita use of food fats and oils will continue, and

8) Increased use of soybean meal in animal feeds and in edible soy products.

Population and income are the primary forces influencing the demand for soybeans and products. Total U.S. population is projected to increase from 209 million at the beginning of 1973 to around 246 million by 1985 (Census Series "D" projections)—a growth rate of 1.2% per year. In percentage terms the increase to 1985 is 18%. With more workers and a continuation of the uptrend in productivity, the gross national product (GNP) of the economy in real terms (1958 dollars) is projected to rise by about 4% per year. This rate of economic growth can be expected to result in increased after-tax incomes and a continued expansion of consumer buying power.

Soybean Requirements Expanding

Since 1959 U.S. soybean production increased more than 140% to a record 1.3 billion bushels in 1972. Most of the gain reflected the doubling of harvested acreage—from 23 million to 46 million. Yields increased only from 23½ bushels per acre to 28 bushels. The average annual increment in soybean yields during 1959-72 was 0.4 bushel per acre, or about 1½% per year. Total soybean utilization trended upward along with increased output, and prices to farmers usually averaged above the government support rates.

U.S. soybean utilization also increased, from about 0.5 billion bushels in 1959 to a record 1.3 billion this year, mainly reflecting the uptrend in domestic crushings and exports. The average annual rate of increase was 58 million bushels or 7% during this period. Continuation of such a strong rate of increase through the mid-1980's does not appear likely. A more moderate rate of gain is projected, averaging around 4% per year, about half the rate for the preceding 13 years. Based on this annual increment, total soybean requirements are projected to increase 40% by 1980 and total 65% more in 1985. The long-run growth rate of exports is projected at a higher level than that for the domestic sector.

Soybeans utilization rates

Item	Average annual rate of growth			
	Actual	1960-72	Projections	1973-85
	Mil. bu.	*Pct.*	*Mil. bu.*	*Pct.*
Total utilization	58	6.8	65	4
Domestic crush	27	5.3	27	3
Exports (raw beans)	26	10.4	36	6

Domestic Demand Growth Unabated

Total domestic use of soybeans doubled during 1959-72, rising from 0.4 billion bushels to 0.8 billion. Domestic markets consist of crushings, planting seed, and other uses. Crusher demand is the major domestic outlet, accounting for over 90% of total soybeans used in the United States. Domestic demand for soybeans is projected to continue upward, reaching a potential 1.2 billion bushels by 1985. In other words, the potential growth in domestic use over the next 10 to 15 years is expected to match the increase that occurred during the past 13 years.

Crush Increase Projected At 3% Rate

Since 1959 soybeans crushed for oil and meal increased from about 400 million bushels to around 750 million estimated for the current marketing year. The average increase was 27 million bushels or 5% per year.

Potential growth in soybean oil and soybean meal markets is projected to raise soybean crushings to 1.1 billion bushels by 1985. This is roughly 50% above 1972 and nearly triple the 1960 crush. While the average annual increment of 27 million bushels is the same as 1960-72, the projected rate of gain is 3% compared with 5% during the previous 13 years.

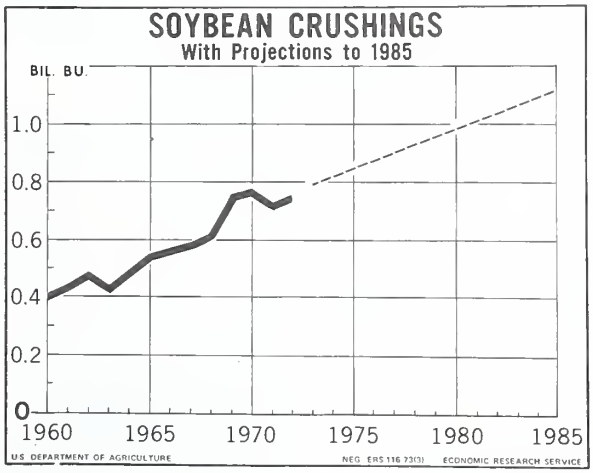

Figure 3

U.S. soybean processing capacity has nearly doubled since 1959, rising from 500 million bushels that year to 925 million estimated for the current season. The average rate of increase was 34 million bushels, or 5½% per year. Soybean processing rose about in line with increased capacity. The long-run average utilization rate of capacity for the industry is about 80%. Demand for soybean products has risen sharply over the years and processing margins have remained favorable, especially in recent years.

The dramatic increase in domestic processing capacity is a reflection of the industry's confidence that world demand for soybean oil and protein will continue to rise and that U.S. soybean products will remain competitive in world markets. Thus, the soybean processing industry likely will be able to accommodate further growth in demand for soybean products during the next 10 to 15 years. Based on

projected crushings, the potential soybean processing capacity requirement by 1985 is 1.3 to 1.4 billion bushels. Edible oil refining capacity and product manufacture likely will expand in similar proportions.

One factor tending to limit the processing industry's growth in exports of soybean oil and meal is the prospective surge in U.S. exports of whole soybeans for crushing abroad. Crushing capacity in the industrialized countries of Western Europe and Japan has been expanding and likely will continue to do so.

Soybean Exports May Double by 1985

Soybean exports are projected to increase sharply over the next decade as worldwide demand expands for high-protein feeds and vegetable oils. U.S. soybean exports may double, reaching 1 billion bushels. The average annual rate of increase during 1973-85 is projected at around 36 million bushels, some 5 to 6% per year. This compares with the 1960-72 growth rate of 26 million bushels or 10% annually.

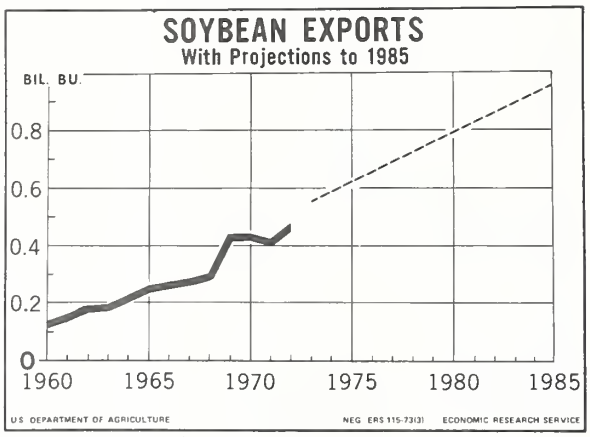

Figure 4

Future growth in U.S. exports will depend on the rate of economic growth in both the developed and the less developed countries. Rising incomes encourage improved diets, including more livestock and poultry products. This in turn generates rising demand for U.S. soybeans and feed grains. The growing overseas demand for soybean protein is particularly evident in the Soviet Union, Asia, and Europe. Particularly significant demand increases have been noted in Japan and Taiwan. The Soviet Union is now taking delivery of its first major purchase of U.S. soybeans, 40 million bushels. In Europe, crushing capacity is continuing to expand dramatically, and purchases of increasing quantities of soybeans from the United States and Brazil are anticipated. One trade estimate places West Europe's crushing capacity over 280 million bushels by 1974, up from 180 million in 1971.

Brazil, the world's second largest exporter of soybeans and products, will continue to increase production—possibly reaching 10 million metric tons by 1980, or 367 million bushels—triple the 1972 level.

A number of developments have brought unusually large elements of uncertainty into long-run forecasts of U.S. agricultural trade. These include (1) New trade relations with the Soviet Union and the People's Republic of China, (2) The expansion of the European Community to include the United Kingdom, Ireland, and Denmark, (3) The realignment of currencies resulting from the Smithsonian Agreement in December 1971 and the additional realignment currently underway, and (4) Unprecedented rates of economic growth in a number of countries, with the possibility of new patterns of food consumption.

Soybean Oil's Share of Domestic Markets Increasing

Soybean oil supplies in the United States are projected around 13 billion pounds by 1985, about 50% or 4 billion pounds above the current year. The major components of demand may be as follows: 10 billion pounds for domestic use, 2 billion for export, and 1 billion for stocks.

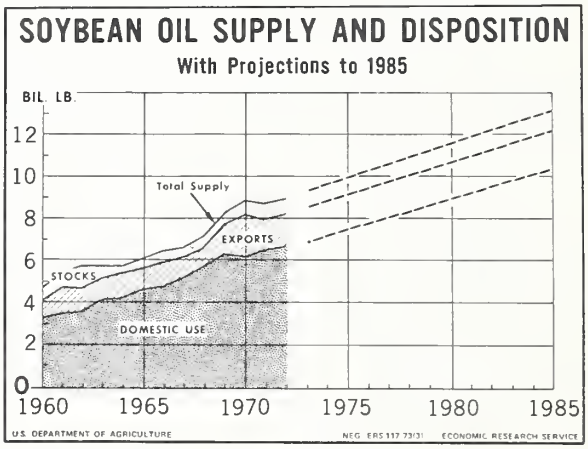

Figure 5

The appraisal of soybean oil potential leads to the overriding conclusion that sharply rising domestic requirements will leave availabilities for export at proportionately lower levels than in recent years. Domestic use recently comprised 80% of total disappearance. The share may reach 85% by 1985.

Soybean oil will continue to gain an ever-increasing share of the domestic food fat market mainly because production responds directly to expanding demand for soybean products. Cottonseed oil and lard are unresponsive to demand and price changes since they are byproducts of the cotton and hog industries. Butter output is affected by the supply of milk and the use of milk in other dairy products.

Domestic use of soybean oil since 1960 has doubled from about 3.3 billion pounds to 6.7 billion estimated for this year. The average annual increase was around 250 million pounds or about 5% per year. All the major food categories—cooking and salad oils, margarine and shortening—registered sharp increases. The 1973-85 projected average annual increase in total domestic use of soybean oil is 0.3 billion pounds.

Soybean oil

Item	Year beginning October		
	1960	1972	1985 projections
	Billion pounds	*Billion pounds*	*Billion pounds*
Stocks	.3	.8	[1] 1
Production	4.4	8.0	12
Supply	4.7	8.8	13
Domestic use	3.3	6.7	10
Exports	.7	1.5	2
Disposition	4.0	8.2	12

[1] Stocks are projected at "adequate levels" of one months requirements.

Soybean oil exports will continue to need P.L. 480 assistance during the next decade but program exports may become less of a market factor than in the 1960's.

Domestic Food Fat Market To Expand A Third

Domestic demand for food fats and oils will continue to expand markedly over the next 10 to 15 years, reaching a potential 15 billion pounds by 1985—some 30% greater than current levels. The indicated gain of 3½ billion pounds during 1973-85 compares with 3 billion in 1960-72. Increased food fat demand stems from population and income growth and greater use per capita. Virtually the entire prospective increase is in soybean oil. Slight net gains in other vegetable oils offset projected declines for animal fats.

Soybean oil has emerged as the leading vegetable oil in the U.S. food fat economy because production has responded to increased demand while supplies of competitive fats and oils have been inelastic. In 1960 soybean oil accounted for 36% of domestic food fat consumption but by 1972 it was over 56% of a 35% larger market. Projections for 1985 indicate that soybean oil's dominance will increase further to two-thirds of all food fats and oils utilized in the United States.

Domestic markets for farm products generally increase only a little faster than population. As incomes rise, people usually do not consume much more food in terms of pounds or calories, but they do upgrade their diet with more red meats, convenience, and other costlier kinds of food. This results in a modest gain in per capita food consumption. Our diets are likely to continue to change in response to growth in income, changes in relative prices, developments of substitutes, and shifts in consumer preferences.

Food fats domestic use

Item	Year beginning October		
	1960	1972	1985 projections
	Billion pounds	*Billion pounds*	*Billion pounds*
Soybean oil	3.4	6.7	10.2
Other vegetable oils	1.7	2.2	2.5
Animal fats	3.7	3.0	2.7
Total	8.8	11.9	15.4
Percentage distribution:			
Vegetable oils	58	75	83
Animal fats	42	25	17

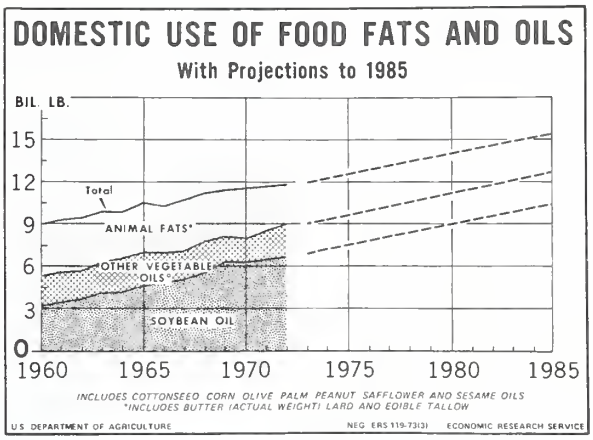

Figure 6

Moderately More Food Fats Per Person

Thanks partly to the french fry and the drive-in hamburger stand, consumption of food fats and oils has increased during the past decade—from 45 to 53 pounds on a fat content basis. A moderate rise is projected over the next 10 to 15 years, possibly to around 60 pounds per person, some 7 pounds above 1972.

For many years now the U.S. consumer has been shifting from animal fat products to vegetable oil products. This trend is projected to continue, with vegetable oils accounting for over four-fifths of the total food fats by 1985.

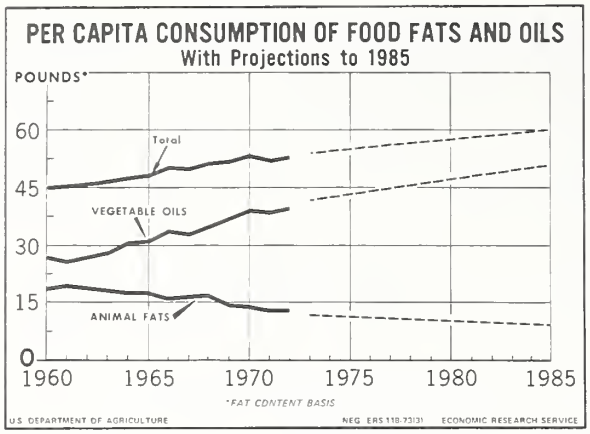

Figure 7

Edible vegetable oil use per person rose from 26 pounds in the early 1960's to 40 pounds in 1972—a whopping 55% increase. Over the next 10 to 15 years, oil use is projected to increase another fourth to 50 pounds.

Animal fat use per person dropped from 19 pounds in the early 1960's to 13 pounds in 1972. Further declines are projected over the next decade, with total use falling to 10 pounds.

Food fat per capita use

Item	Year beginning October		
	1960	1972	1985 projections
	Pounds	*Pounds*	*Pounds*
Soybean oil	16	31	41
Other vegetable oils	10	10	9
Animal fats[1]	19	13	10
Total use for food[1]	45	53	60

[1] Fat content basis.

Edible vegetable oils moved into the dominant position in the U.S. food fat economy mainly because of (1) the sharp growth in output of soybean oil at competitive price levels; (2) the trend of diet-cholesterol-conscious consumers toward using more liquid (unsaturated) oils and less solid (saturated) fats; (3) increased hydrogenation processing which permitted the manufacture of shortening entirely from vegetable oils; and (4) the consumer shift from butter to lower-priced vegetable oil margarines.

What We'll Eat

Now let us view the food fat consumption rate for 1985 by end-products. A possible configuration may be about as follows:

Food fat	Pounds per capita		
	1960	1972	1985 projections
Butter (fat content)	6.2	4.1	3
Margarine (fat content)	7.5	8.9	10
Shortening	12.6	16.8	19
Lard (direct use)	7.5	3.8	3
Salard and cooking oils	9.2	17.1	22
Other edible uses	2.3	2.4	3
Total (fat content basis)	45.3	53.0	60

During 1973-85 the use of table spreads (butter and margarine) is projected to remain steady, but margarine will continue to displace butter. Cooking fats (direct use of lard plus shortening) are projected to increase about 2 pounds per capita, with gains in shortening more than offsetting the lard downtrend. Cooking and salad oils will continue to lead the increase in U.S. consumption of food fat products—rising a potential 5 pounds by 1985.

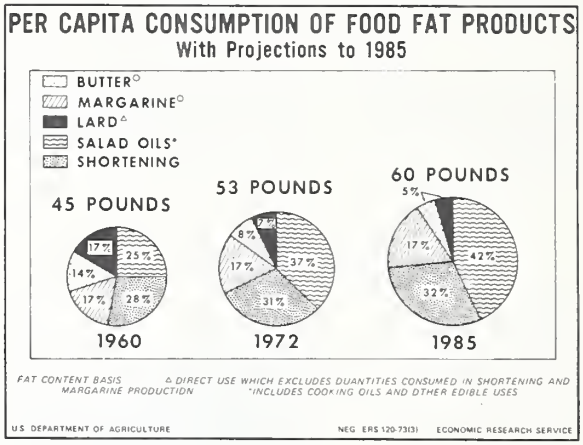

Figure 8

Soybeans Meal Use To Expand In Feed and Edible Soy Products

Demand for soybean meal is the key determinant in the volume of soybeans crushed. For many years protein demand outstripped oil demand and large quantities of soybean oil were in surplus and exported under P.L. 480 programs. Soybean meal is not a storable commodity and stocks usually remain relatively low. About the only sizable carryover of soybean protein from one crop year to the next is in the form of the raw soybeans.

Soybean meal supplies increased from about 10 million tons in 1960 to 18 million this year. About the same level of increase is projected for the next 10 to 15 years, reaching a potential supply of 26 million tons by 1985. Domestic demand for animal feeds and edible soy products will account for most of the

gain—rising from 13 million tons in 1972 to 21 million by 1985. High-protein consuming animal units are projected to rise about a fourth (from 143 million to 175 million) along with a continuing increase in the quantity fed per animal unit.

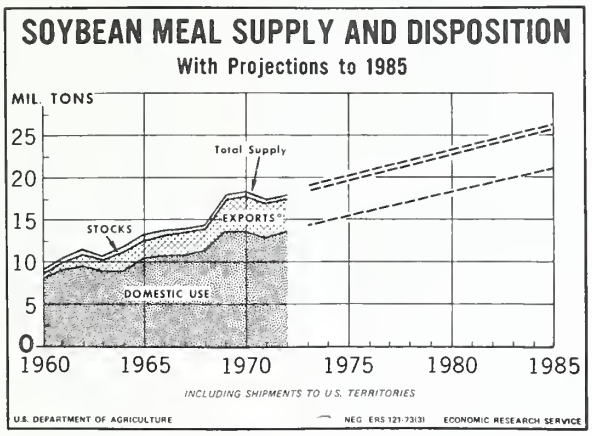

Figure 9

Exports of soybean meal are expected to increase only moderately from the 4-million-ton level in 1972, since the bulk of increasing overseas requirements for soymeal will be met chiefly through the importation of U.S. soybeans.

Soybean meal

Item	Year beginning October		
	1960	1972	1985 projections
	Million tons	*Million tons*	*Million tons*
Stocks	.1	.2	([1])
Production	9.5	17.6	26
Supply	9.6	17.8	26
Domestic use[2]	8.9	13.3	21
Exports	.6	4.3	5
Disposition	9.5	17.6	26

[1] Less than 500,000 tons. [2] Includes animal feeds and edible soy products.

Sharp increases are projected in the use of soybean protein foods (flour and grits, concentrates, isolates and textured items—extruded and spun) over the next decade. The first significant market penetration in red meat and poultry by vegetable proteins probably will be as extenders in institutional markets. A USDA study projects that by 1980 vegetable protein will replace 20% of the red meat in processed foods, amounting to 8% of the total red meat production. Preference for meat texture and taste has so far limited the substitution, but advances in food technology continue to improve the acceptability of meat substitutes. Only fragmentary data are available on U.S. production of soy protein foods. In 1970, an estimated 600-700 million pounds of these foods were produced, requiring about 400,000 tons of processed soybean meal.

Soymeal May Comprise Three-Fourths Of High-Protein Feeds

Total high-protein feeds available for feeding are projected to rise sharply over the next 10 to 15 years, reaching a potential 29 million tons (44% protein soybean meal equivalent) by 1985. This compares with 20 million tons in 1972 and is nearly double the 1960 tonnage. About 90% of the prospective gain will be in soybean meal. Animal protein (tankage and meat meal, fish meal and dried milk products) and grain protein (gluten feed and meal, brewers' and distillers' dried grains) are each expected to rise a half million tons during 1973-85. In 1985 soybean meal may account for three-fourths of total high-protein feeds available, in contrast with 65% this season.

High protein feed availability[1]

Item	Year beginning October		
	1960	1972	1985 Projections
	Million tons	*Million tons*	*Million tons*
Soybean meal[2]	8.9	13.3	21
Other oilseed meals	2.4	2.3	2
Animal protein	3.3	3.3	4
Grain protein	.9	1.4	2
Total	15.5	20.3	29
% soy meal	57	65	73

[1] In terms of 44% protein soybean meal equivalent. [2] Includes animal feeds and edible soy products.

Demand for feed is a function of livestock production and prices, and the price of feed. Livestock production in 1985 is projected to increase by over one-fourth from the 1969-71 level, as follows:

Item	Unit	1969-71 average	Projected 1985	increase
		Million units	*Million units*	*Percent*
Cattle and calves[1]	pounds	22,185	32,250	45
Hogs[1]	"	13,728	16,900	23
Chickens[2 3]	"	8,478	13,020	54
Turkeys[3]	"	1,727	2,620	51
Eggs	dozens	5,863	6,870	17
Milk[4]	cwt.	1,174	1,210	3
Total livestock production	Index 1967=100	105	134	28

[1] Carcass weight. [2] Farm chickens and commerical broilers. [3] Ready-to-cook basis. [4] Milk equivalent, fat solids basis.

The feeding rate may rise slightly over the next 10 to 15 years if livestock-feed ratios continue relatively favorable. Beef and milk production is likely to come increasingly from concentrate feeding—from the grain and high-protein feeds rather than from roughage. Thus, even though physical feeding efficiency is expected to increase for most livestock items, total concentrates fed in 1985 should be up around 40% from 186-million-ton average of 1969-71.

Until the early 1960's use of high-protein feeds had been rising more rapidly than use of total feed concentrates. However, in the last few years, the rate of increase for high-protein feeds has slowed somewhat, apparently in response to the increasing use of urea in cattle feeding. Projected feed use for 1985 assumes a further modest increase in urea and possibly other protein substitutes such as petro-protein meal.

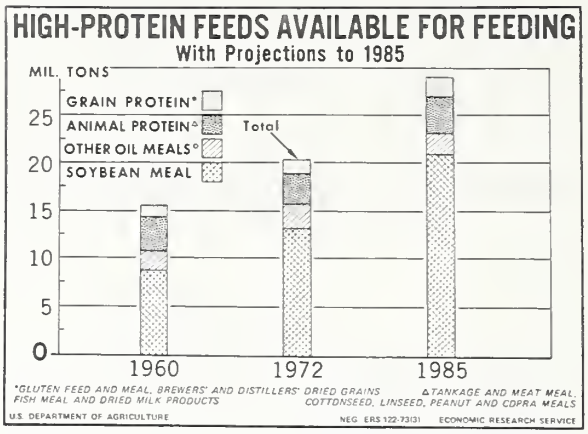

Figure 10

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